

Prašnjavi Univerzum u kosmološkim simulacijama

Ana Trčka

Seminar Katedre za astronomiju

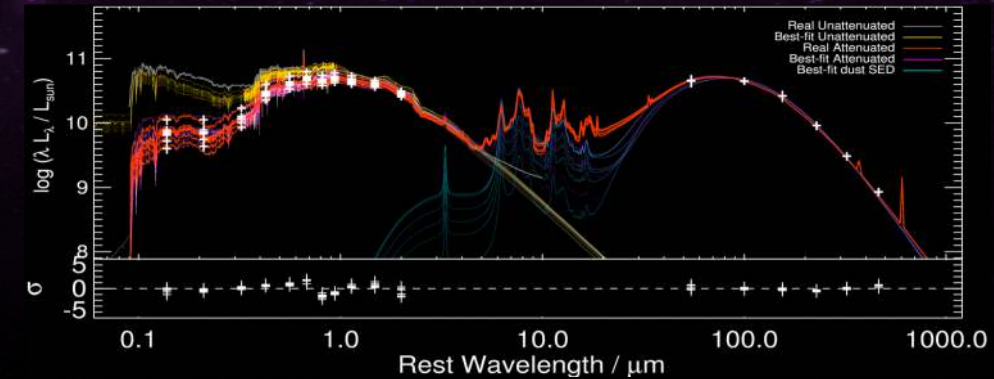
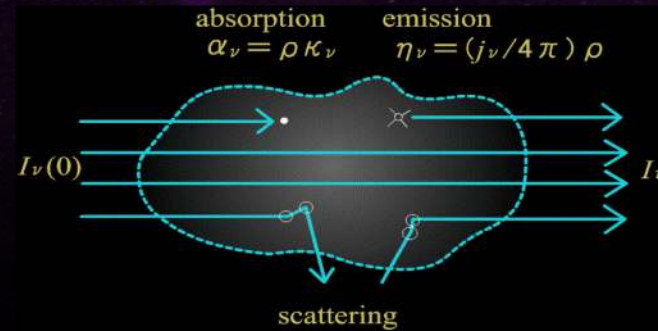
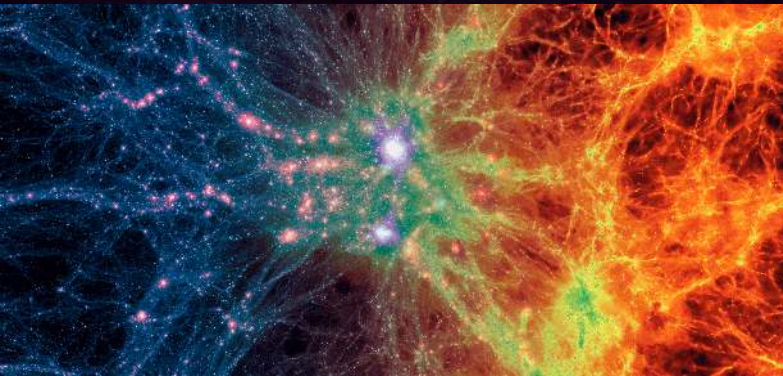
07/12/2021



GHENT
UNIVERSITY

 FACULTY
OF SCIENCES

Pregled

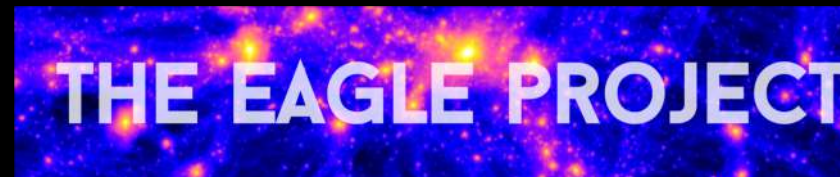


- Metode:

1. Kosmološke hidrodinamičke simulacije
2. Prenos zračenja
3. Fitovanje spektralne distribucije energije galaksija (SED fitting)

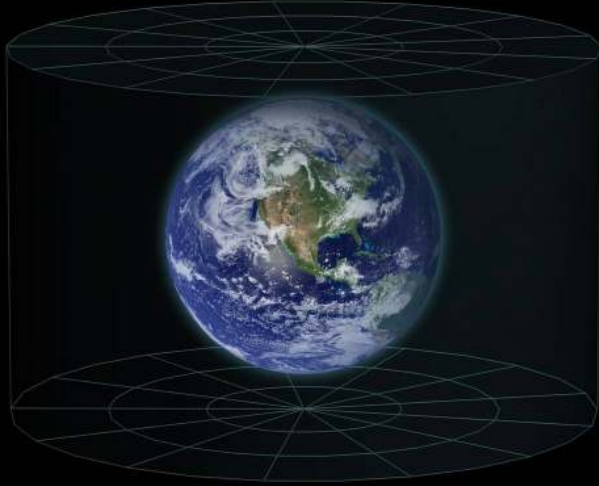
- Rezultati:

- EAGLE simulacije
- IllustrisTNG simulacije

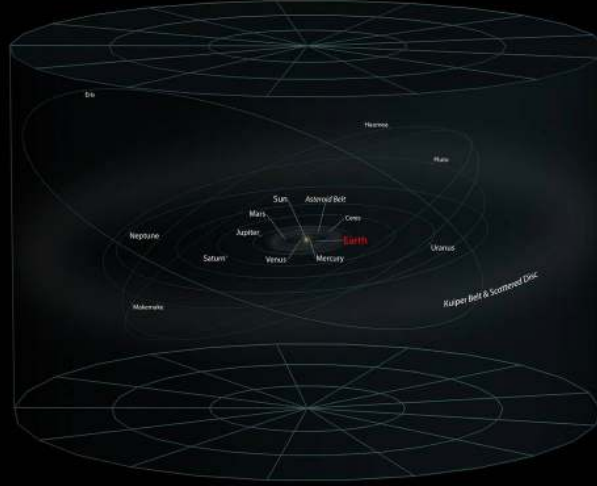


1. Kosmološke hidrodinamičke simulacije

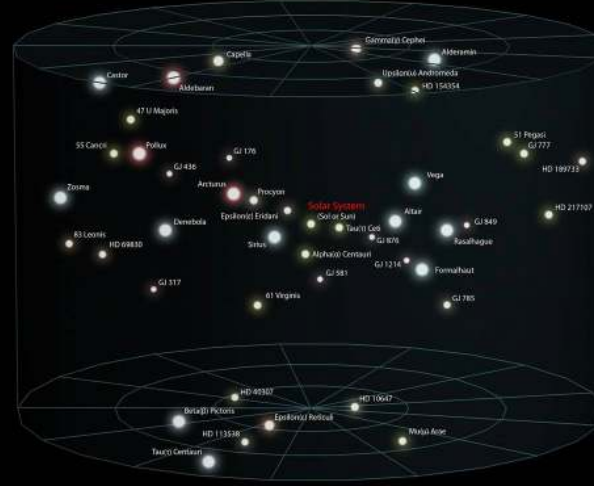
Earth



Solar System



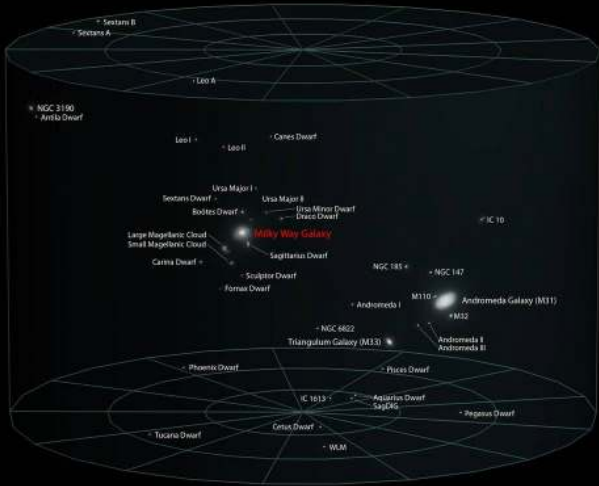
Solar Interstellar Neighborhood



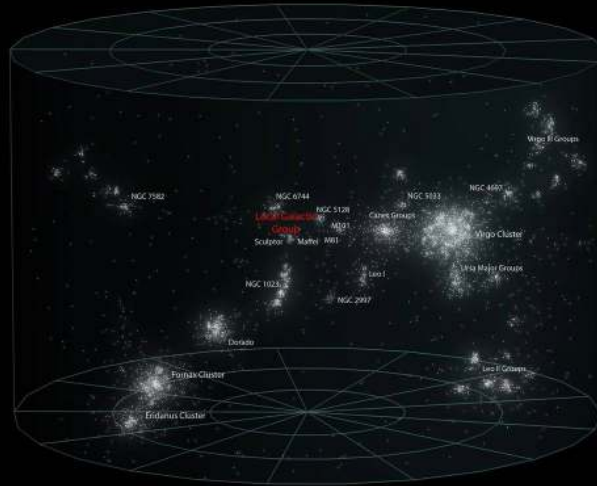
Milky Way Galaxy



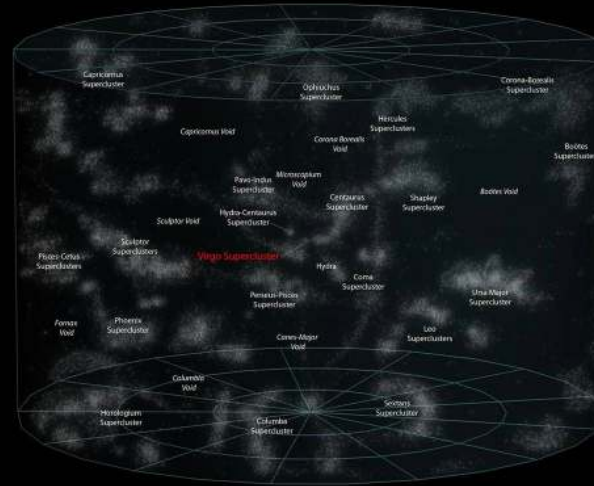
Local Galactic Group



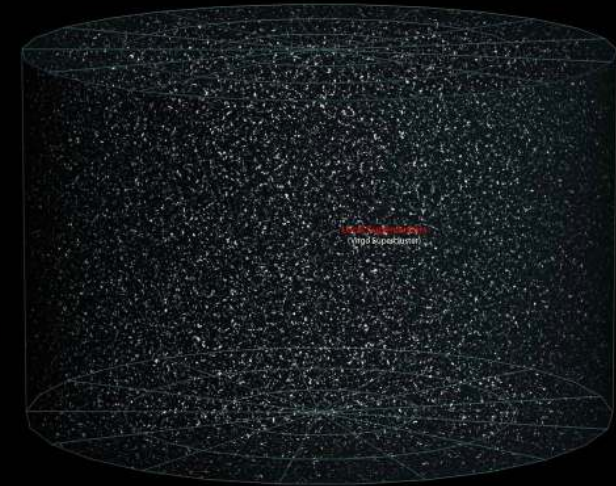
Virgo Supercluster



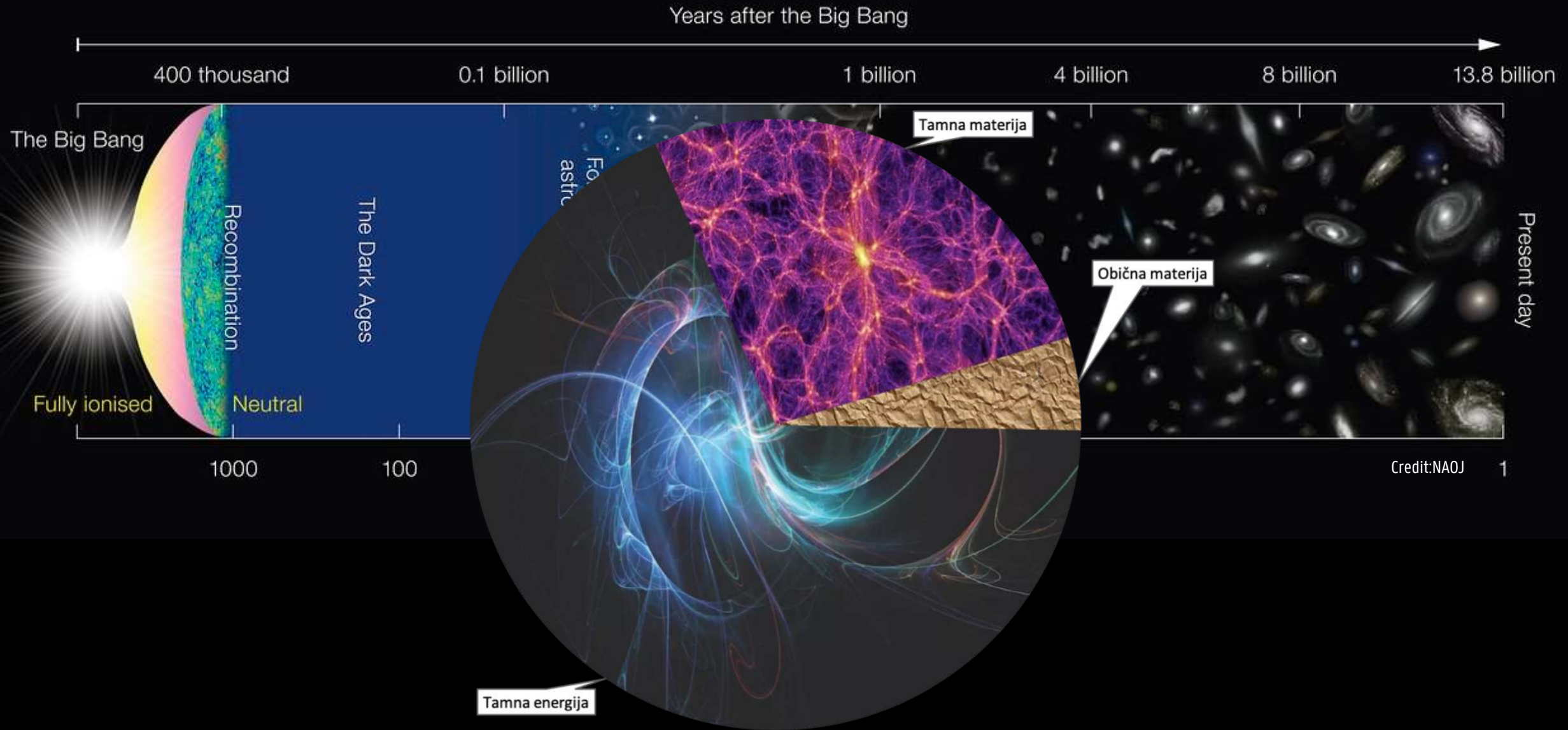
Local Superclusters



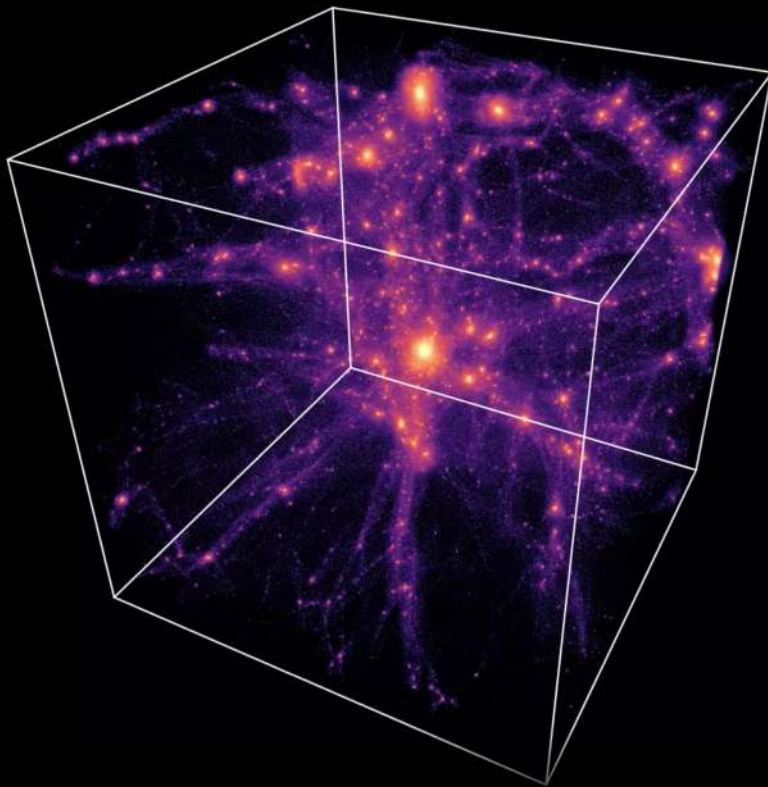
Observable Universe



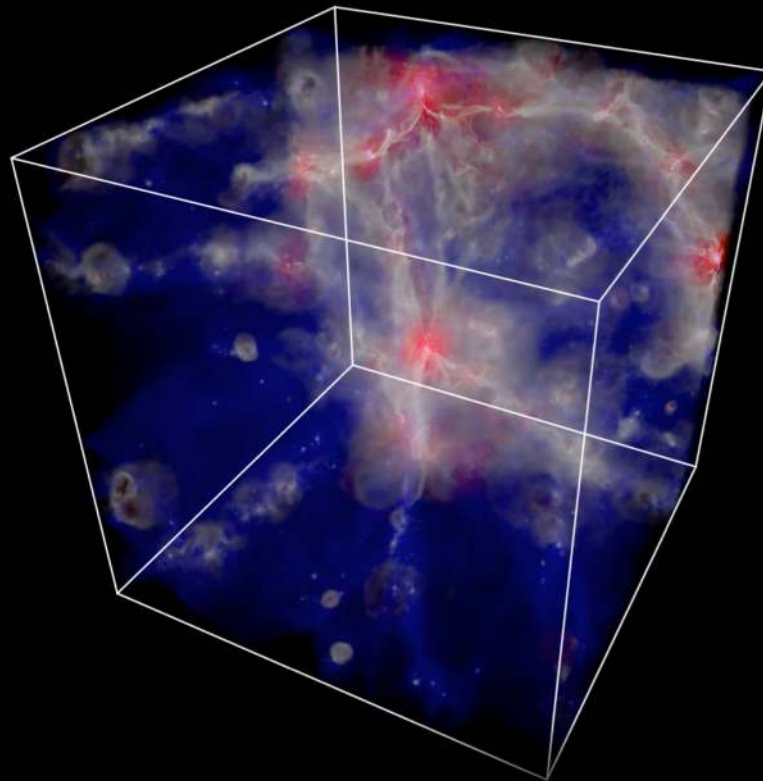
1. Kosmološke hidrodinamičke simulacije



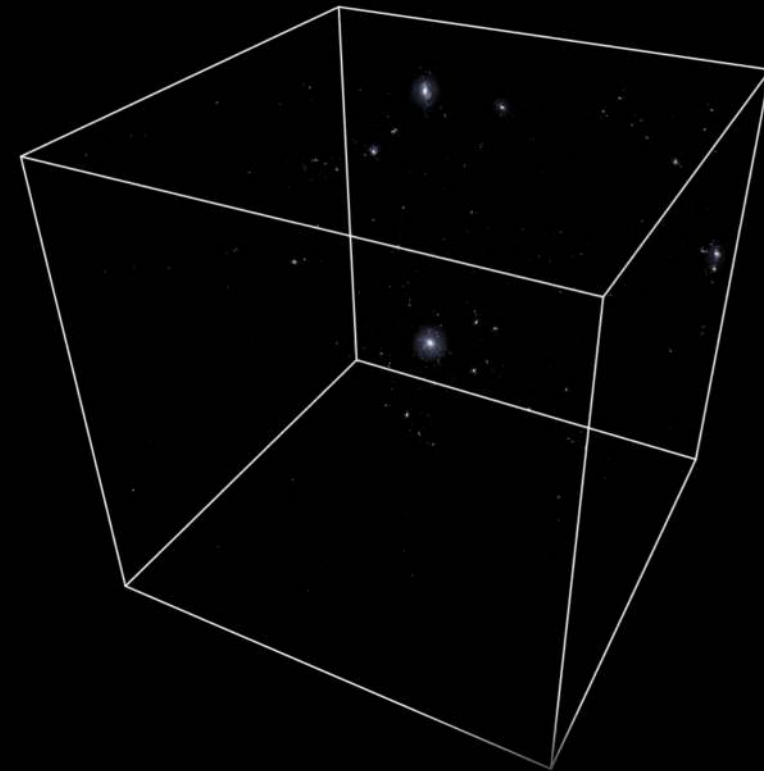
1. Kosmološke hidrodinamičke simulacije



Tamna materija



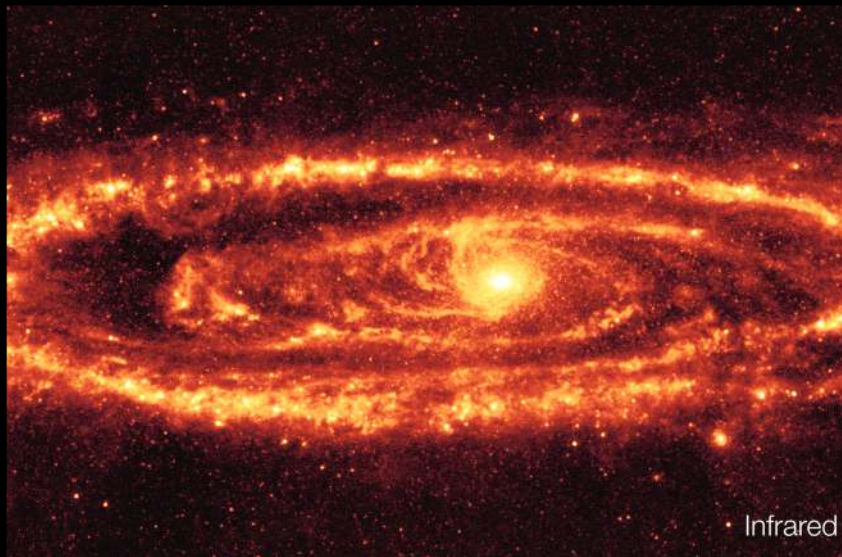
Gas



Zvezde

Tretiranje procesa ispod rezolucije

Motivacija



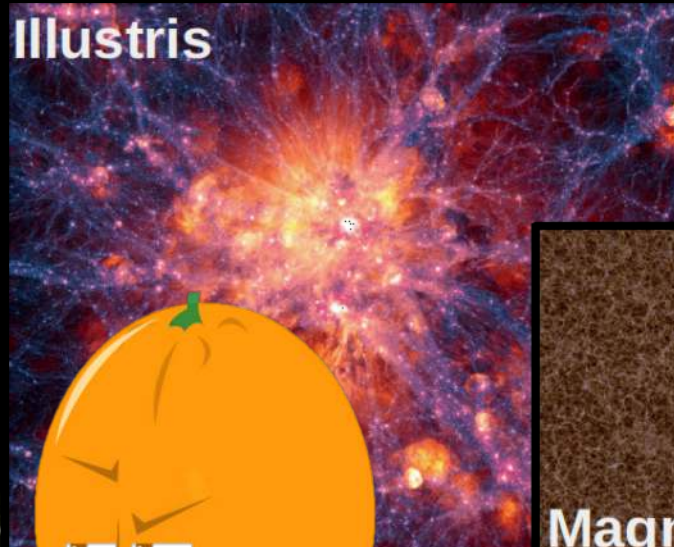
GALEX



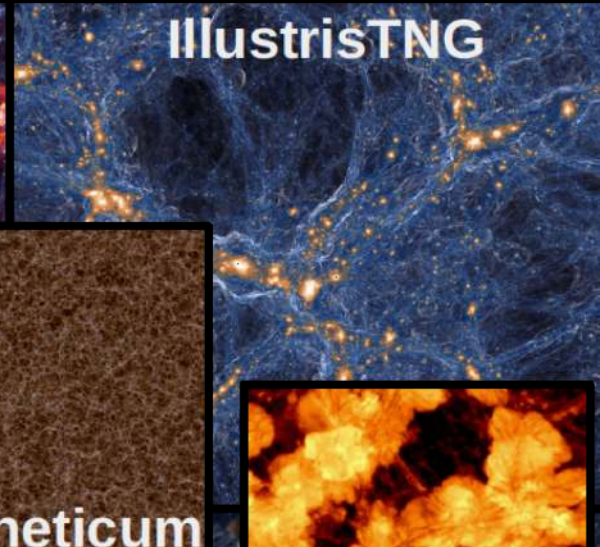
Infrared (Spitzer)



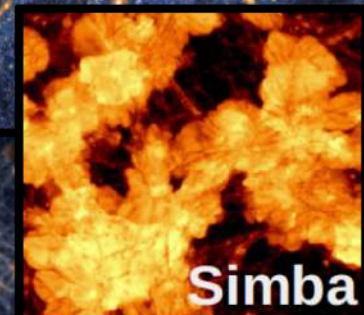
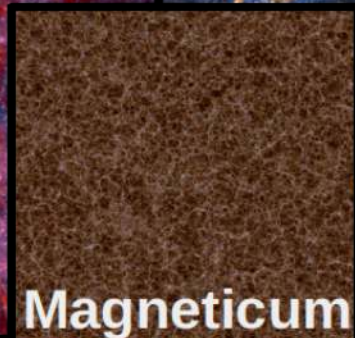
Illustris



IllustrisTNG



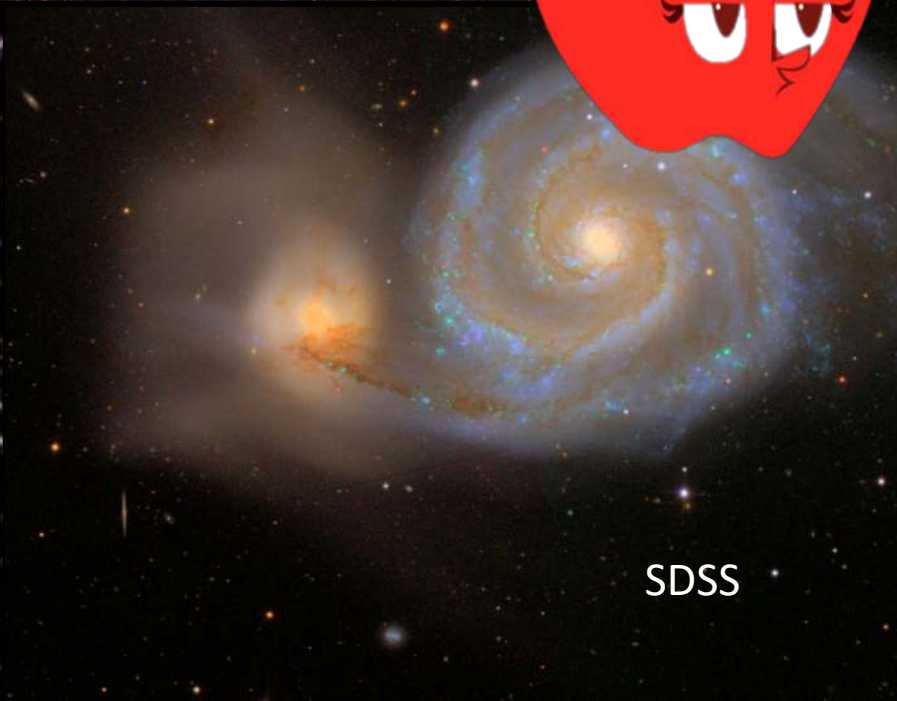
Magneticum



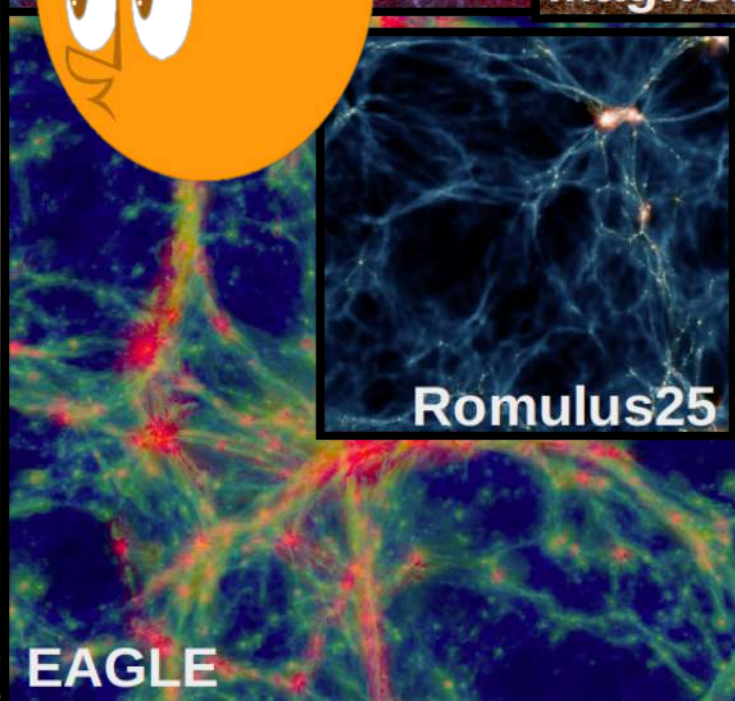
Simba



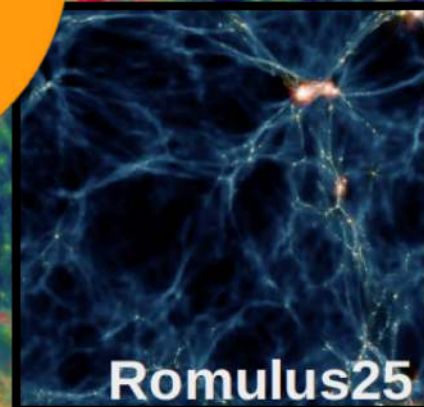
Hubble



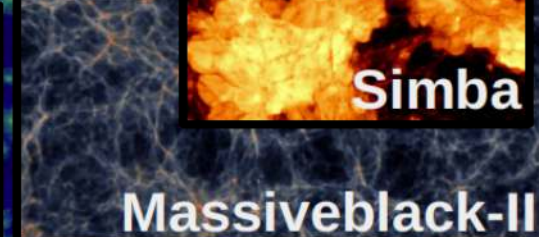
SDSS



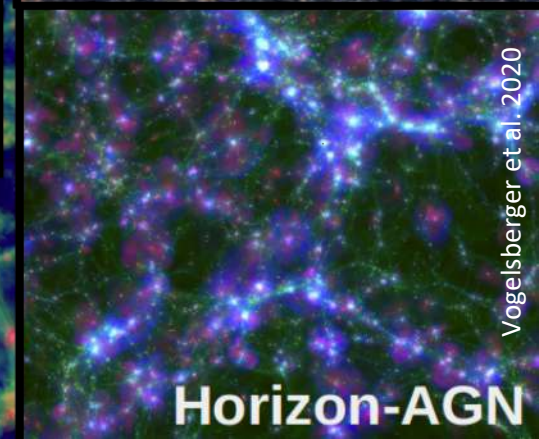
EAGLE



Romulus25

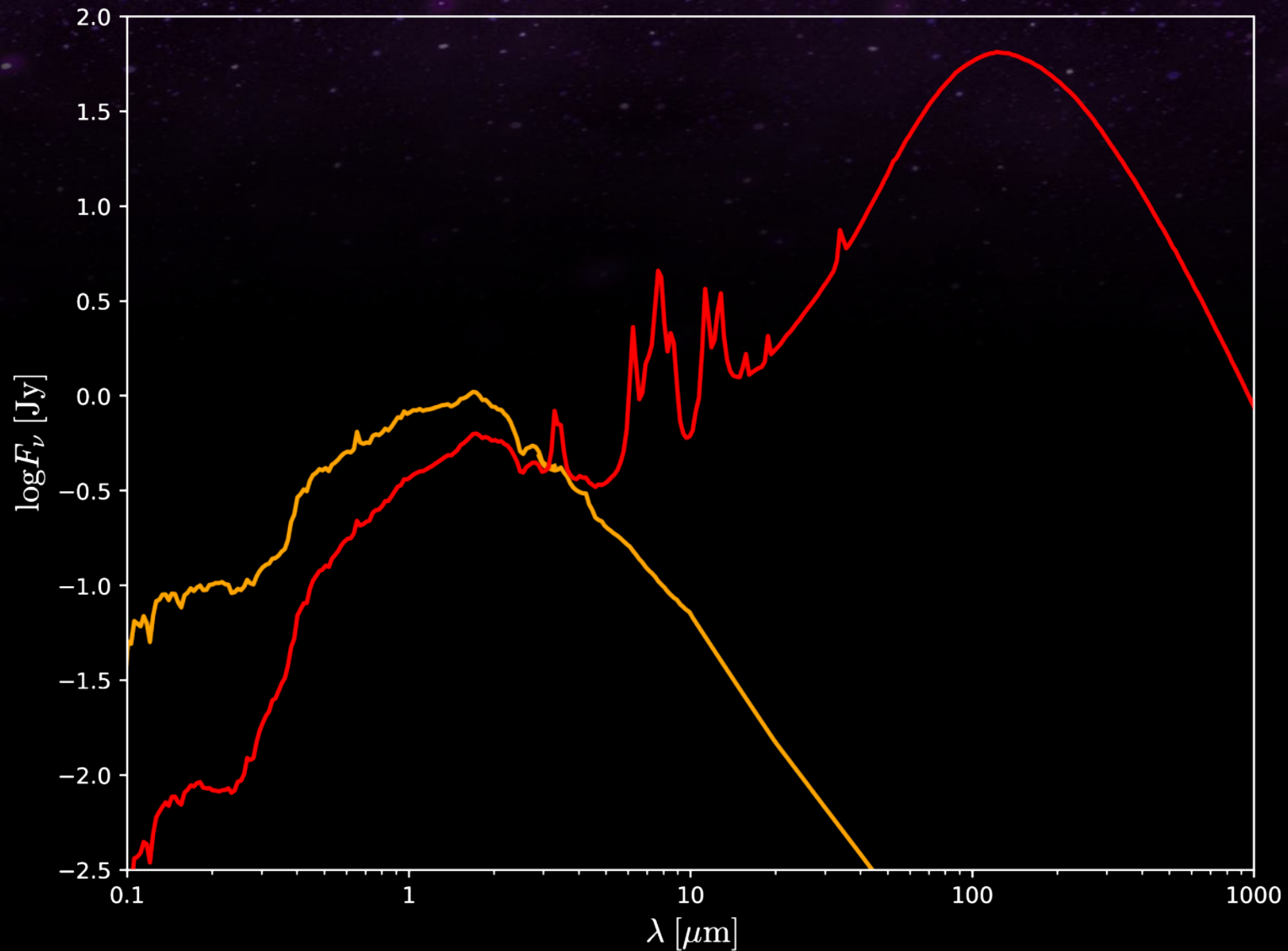


Massiveblack-II

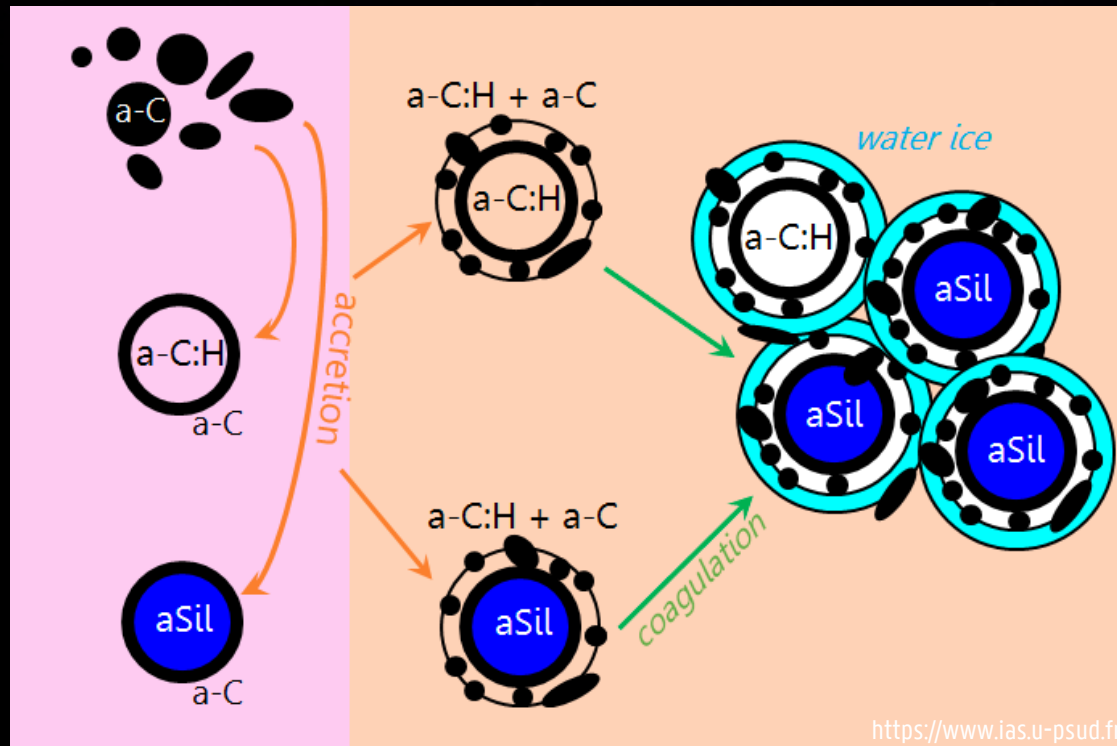
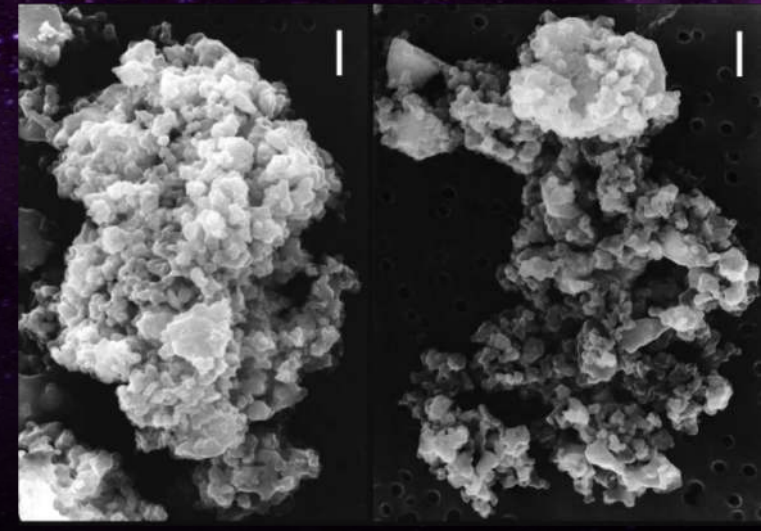
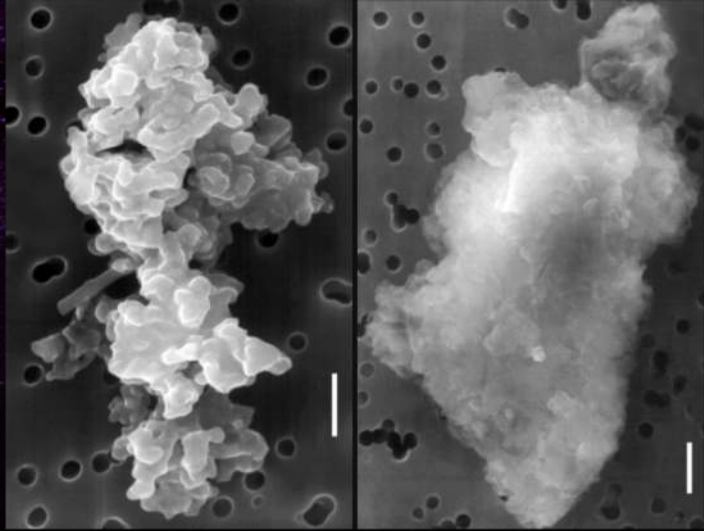


Horizon-AGN

Spektralna distribucija energija galaksija



Prašina



Efekti prašine



Credit: ESO

Apsorpcija

Emisija



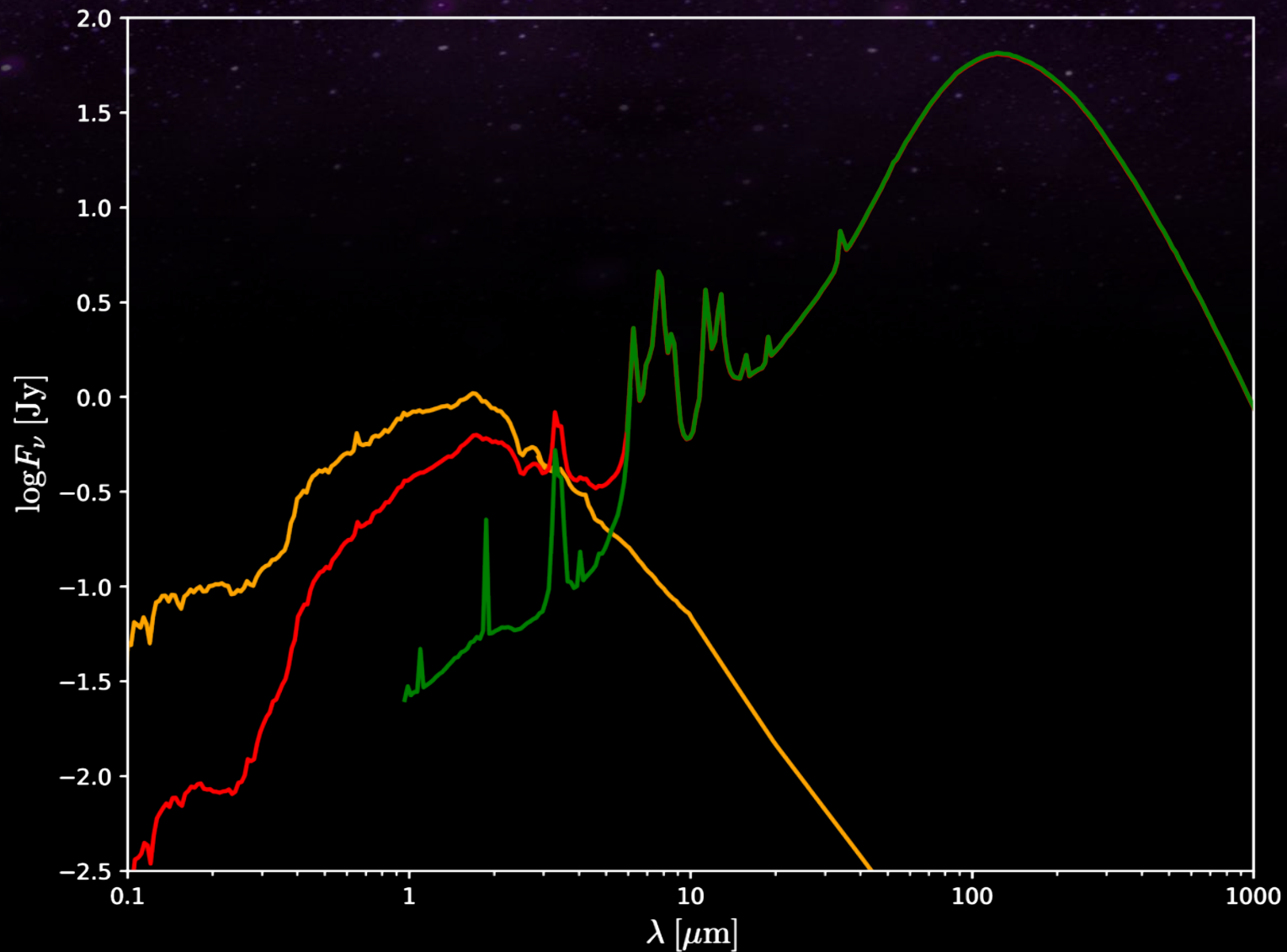
ESA/Herschel/PACS/SPIRE/Hill, Motte, HOBYS Key Programme Consortium;
ESA/XMM-Newton/EPIC/XMM-Newton-SOC/Boulanger



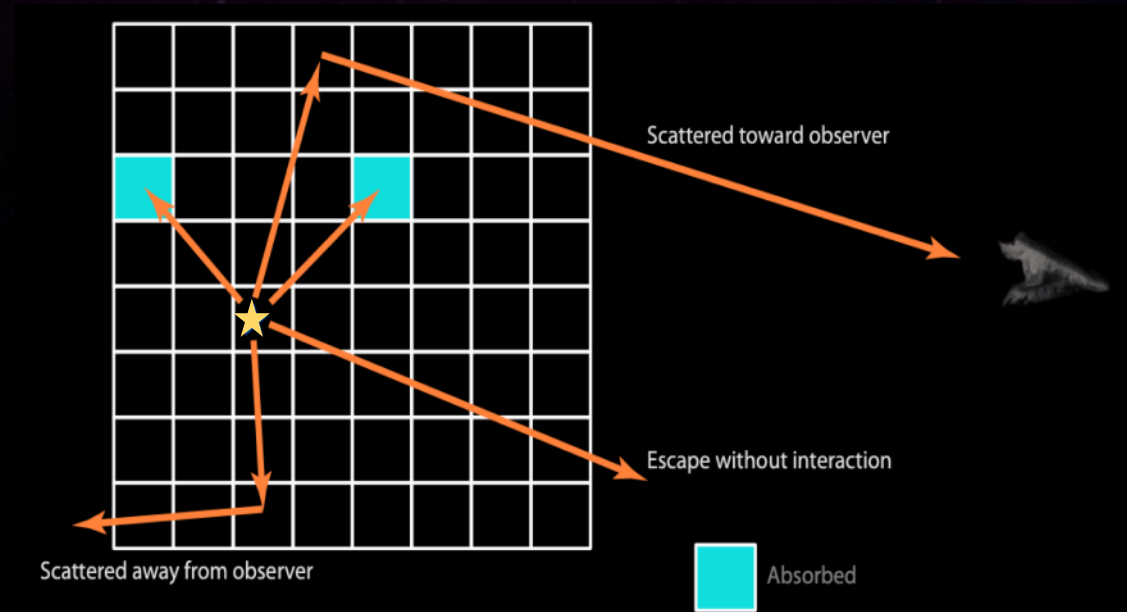
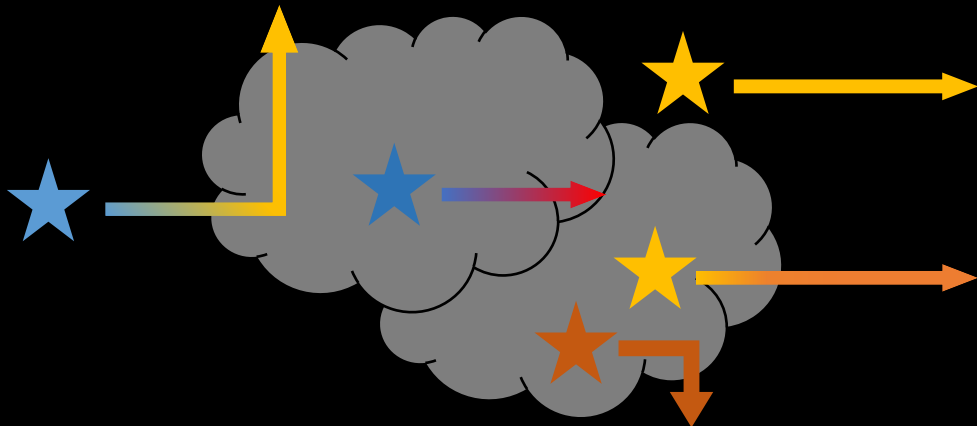
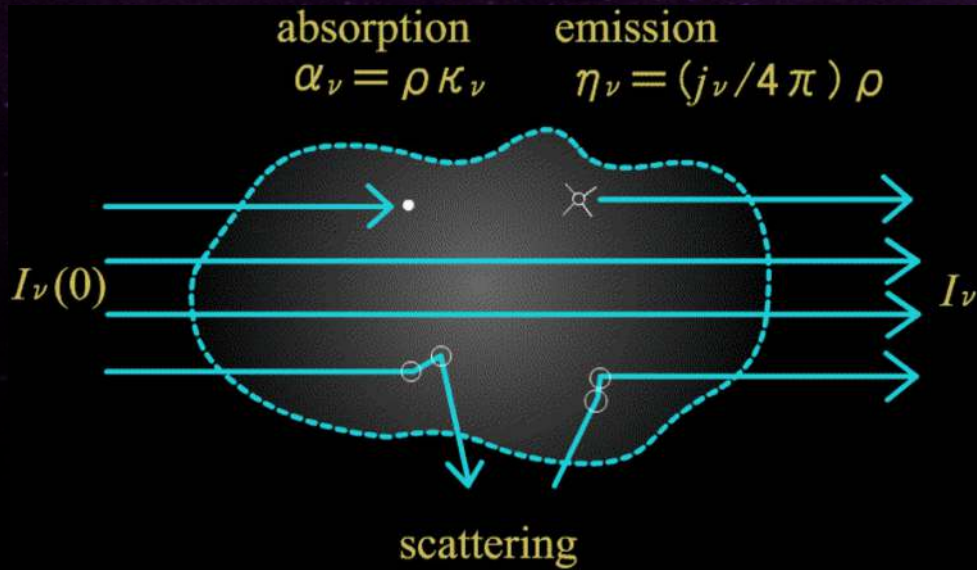
Credit & Copyright: John Davis

Rasejanje

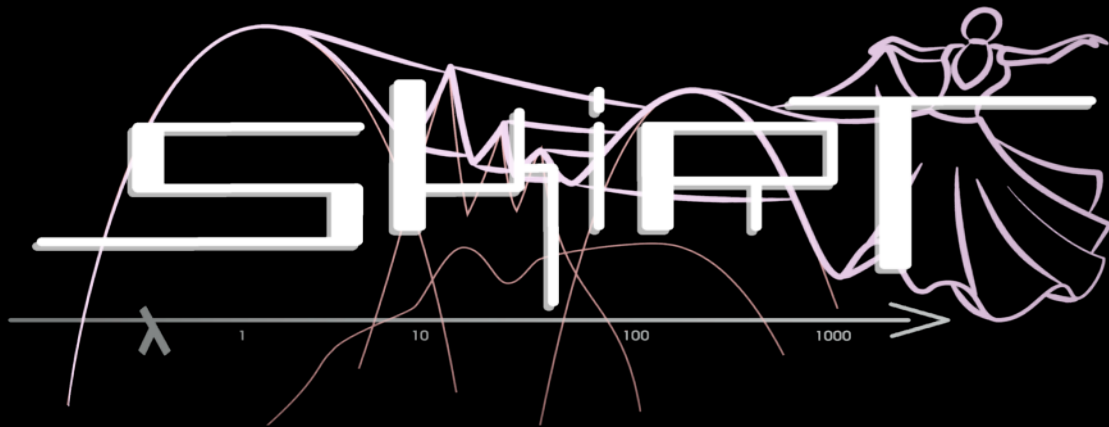
Spektralna distribucija energija galaksija



2. Prenos zračenja



2. Prenos zračenja

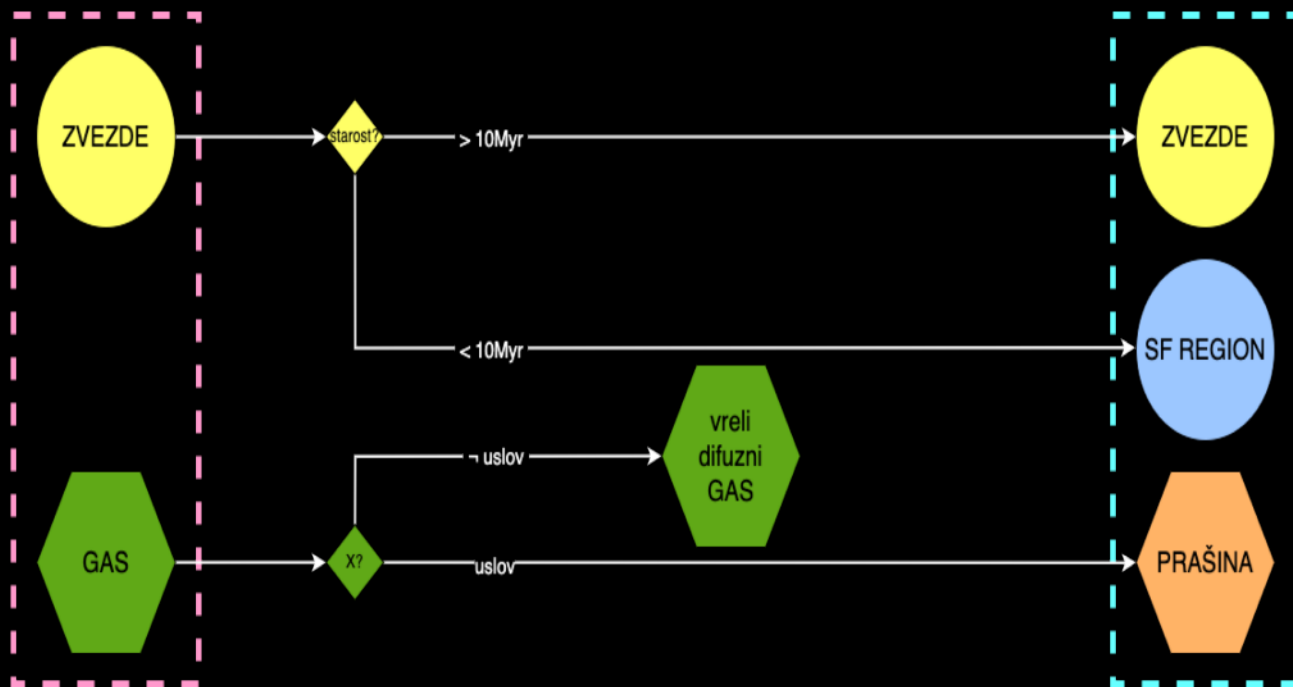


- 3D Monte Karlo
- Apsorpcija
- Rasejanje
- Emisija
- Postprocesiranje CH simulacija

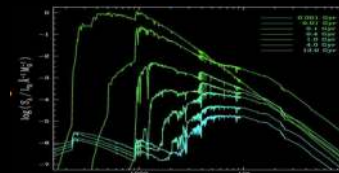
2. Postprocesiranje

Rezultat simulacije

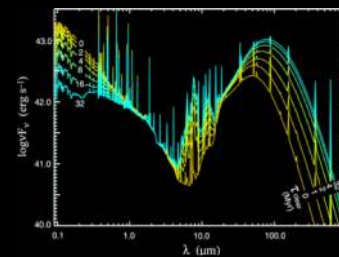
SKIRT ulaz



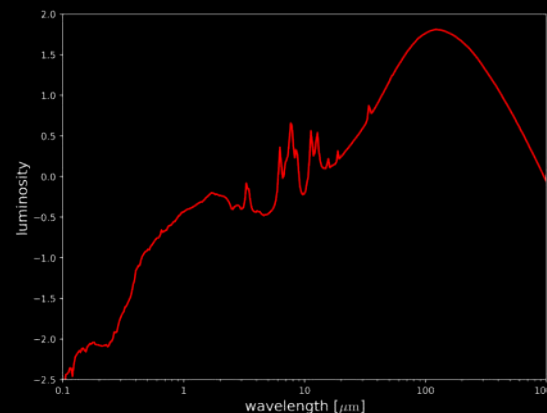
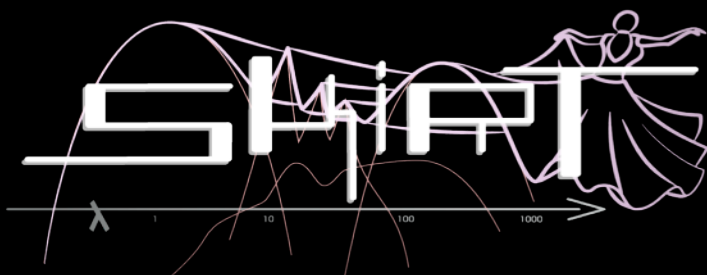
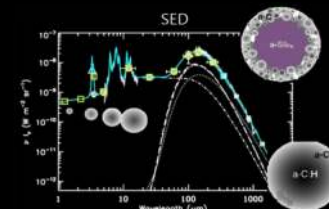
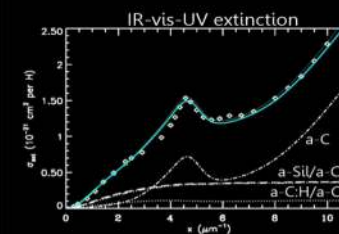
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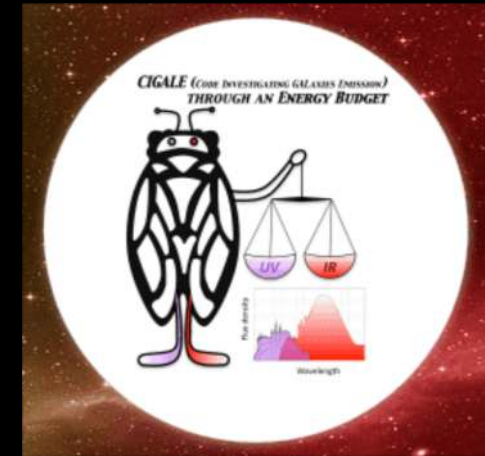
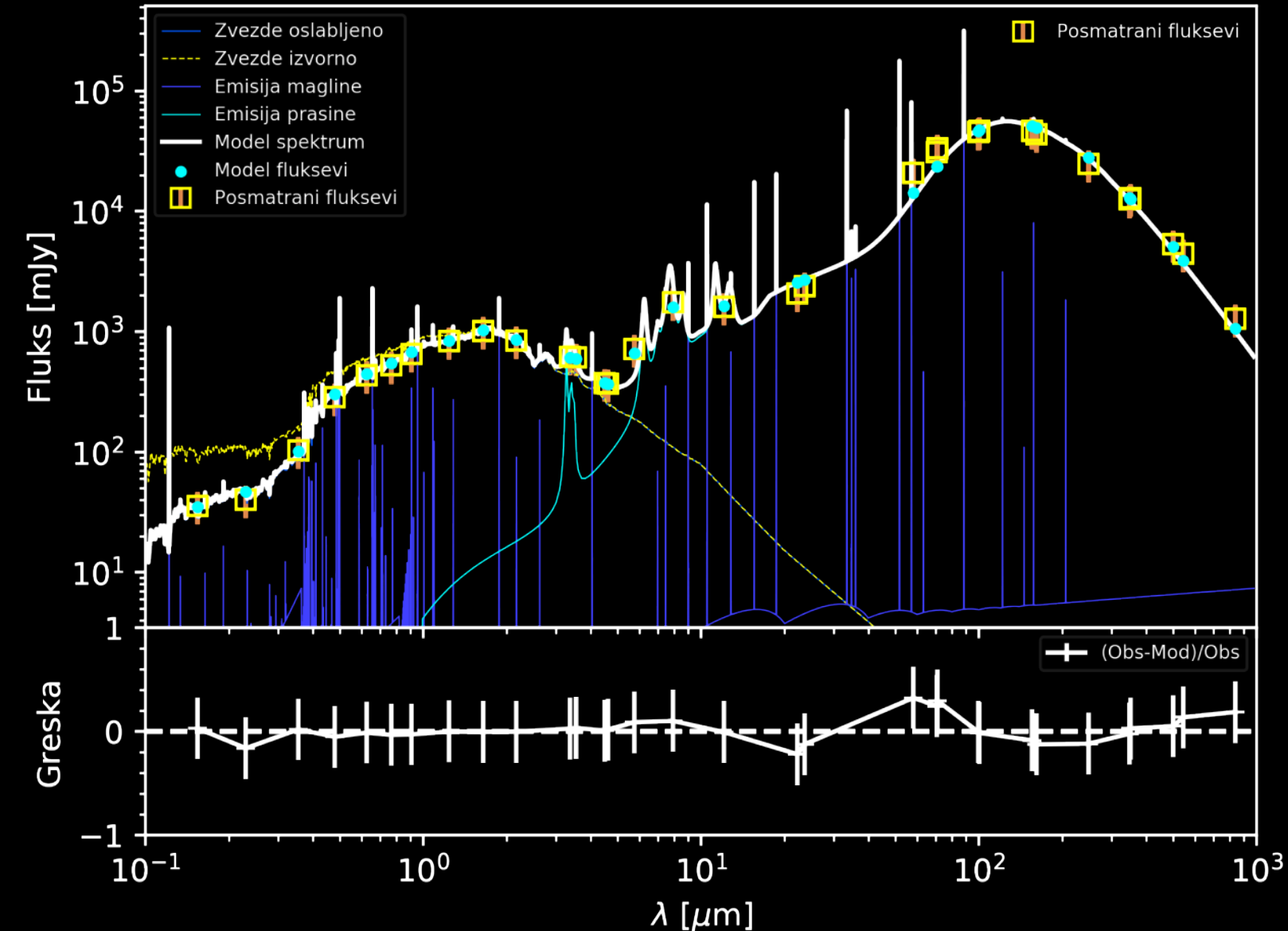
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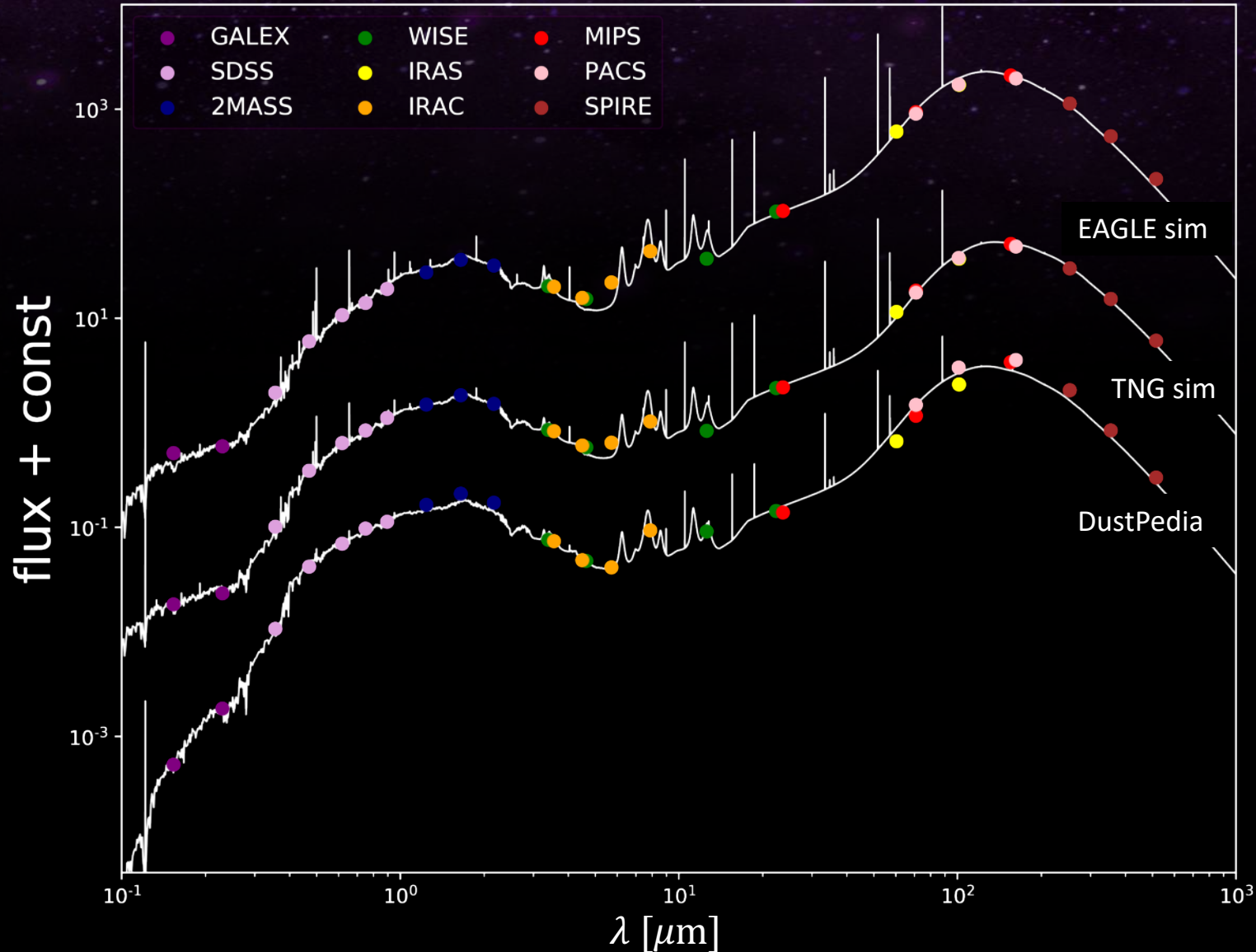


3. Fitovanje spektralne distribucije energije galaksija (SED fitting)

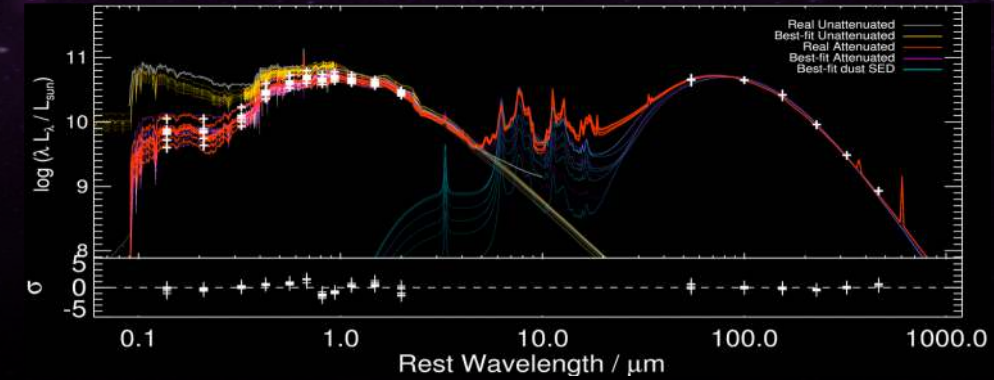
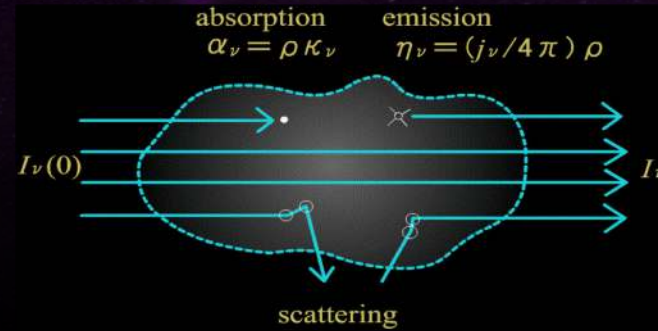
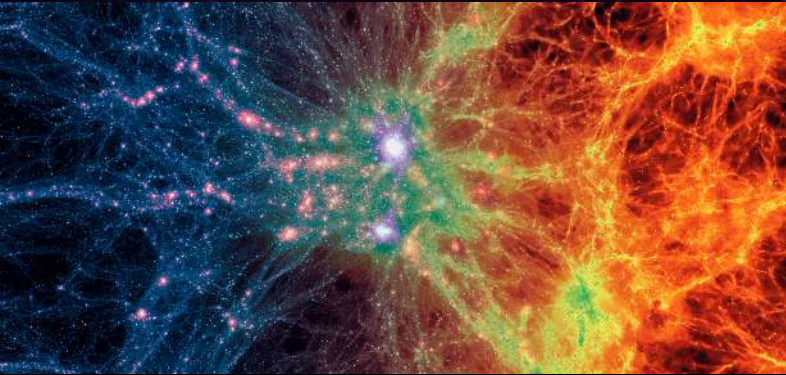


- Pretpostavke
- Bajesova statistika

Fitovanje spektralne distribucije energije galaksija (SED fitting)



Pregled

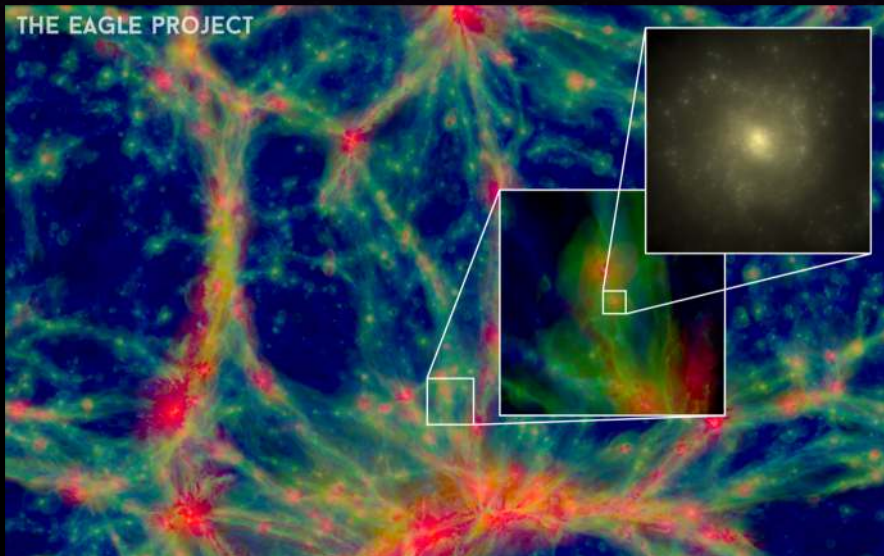


- Metode:

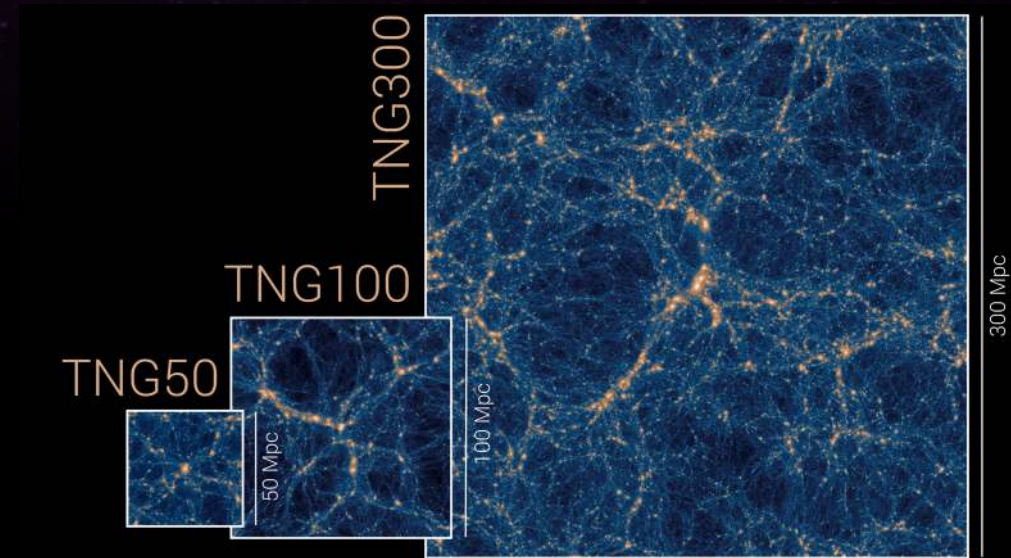
1. Kosmološke hidrodinamičke simulacije
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Simulacije

Kosmološke hidrodinamičke

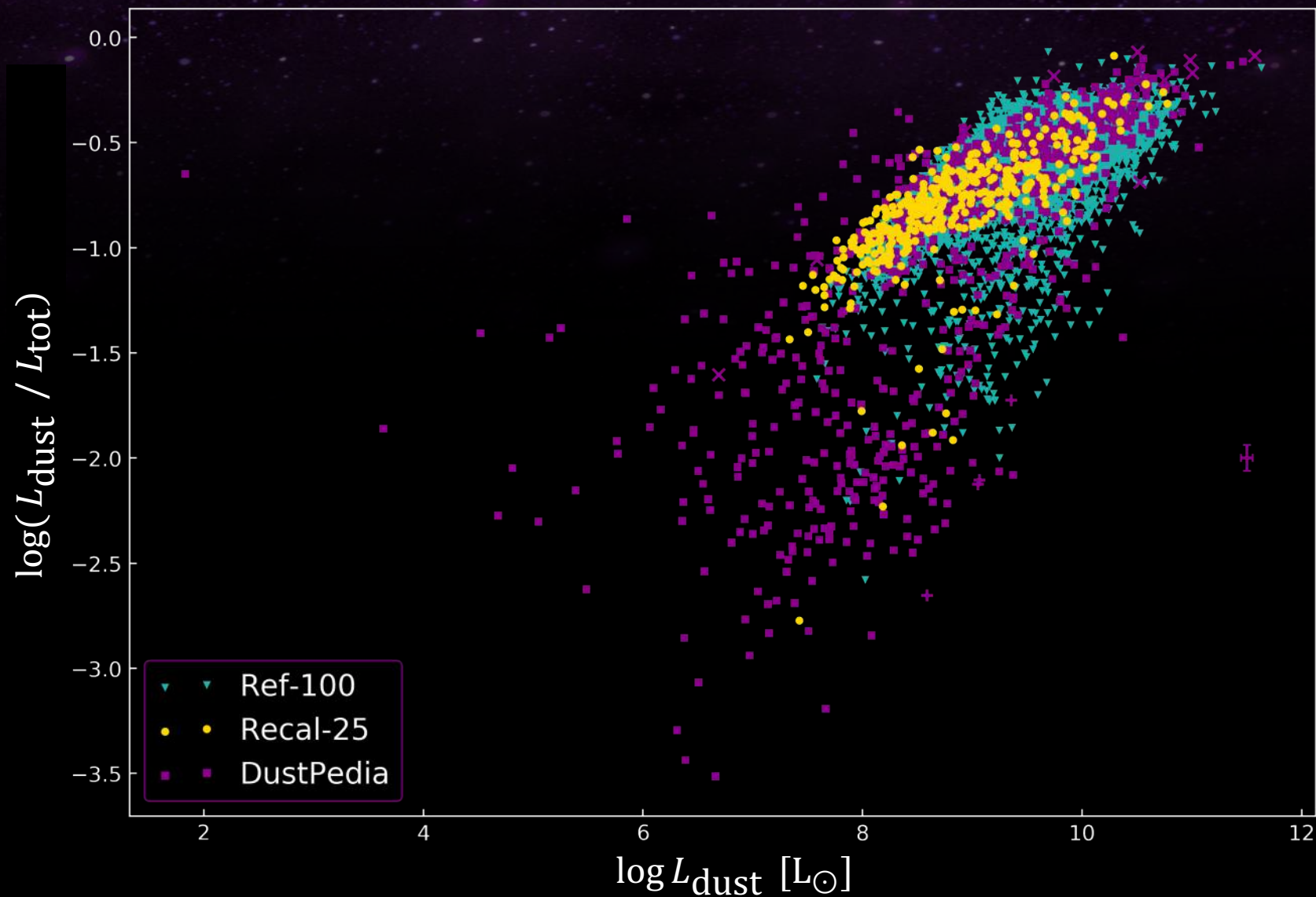


- 25 - 100 Mpc strana kutije
- $0.3 - 1.8 \times 10^6 M_{\odot}$
- 0.3 - 0.7 kpc



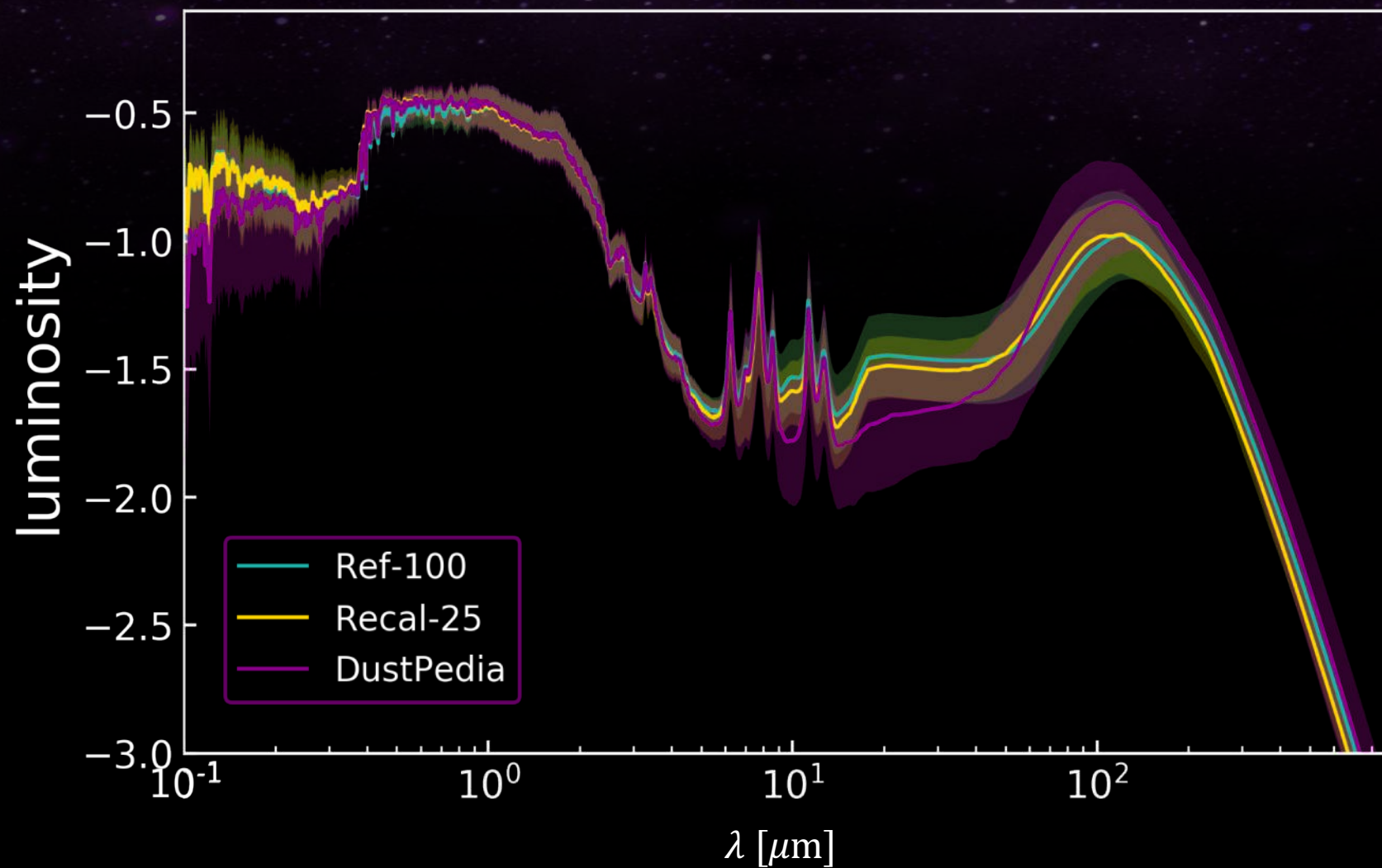
- 50 cMpc strana kutije
- $8.5 \times 10^4 M_{\odot}$
- 0.07 kpc

Fizičke karakteristike



EAGLE

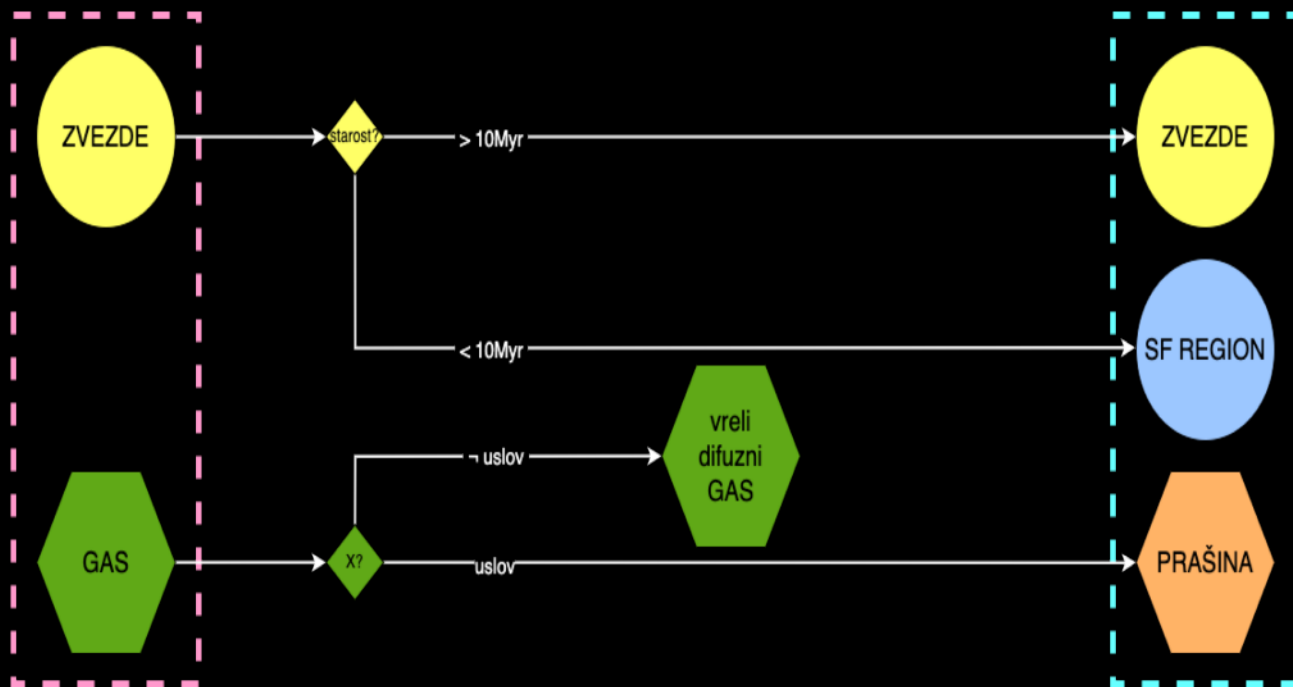
Galaktička emisija - poduzorak



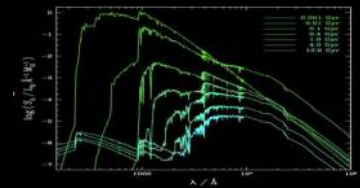
2. Postprocesiranje

Rezultat simulacije

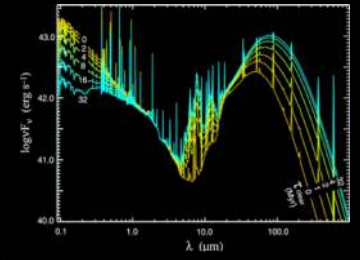
SKIRT ulaz



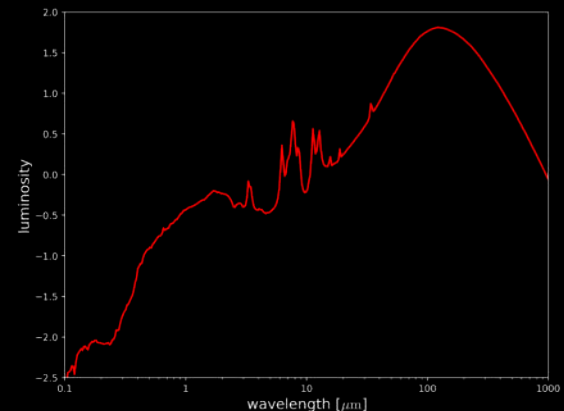
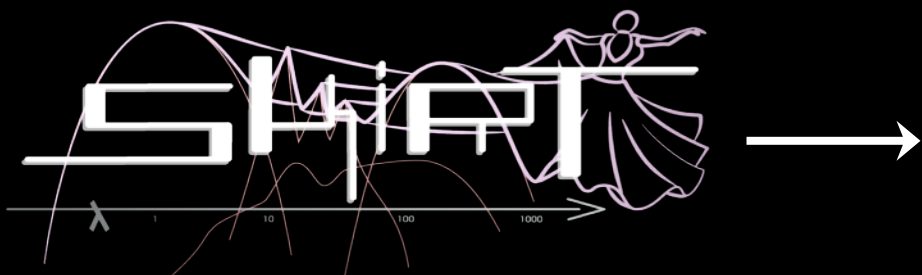
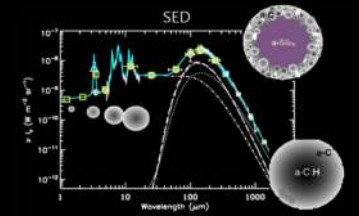
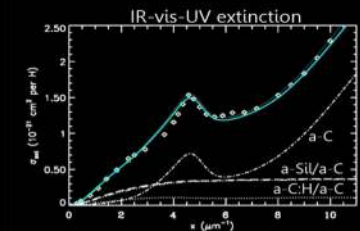
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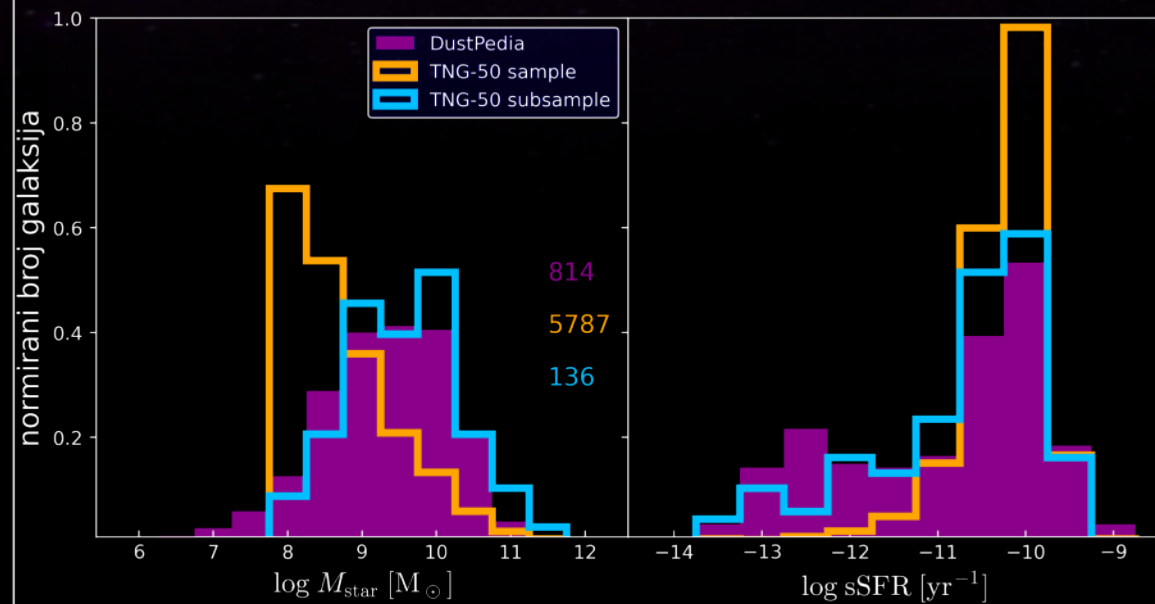
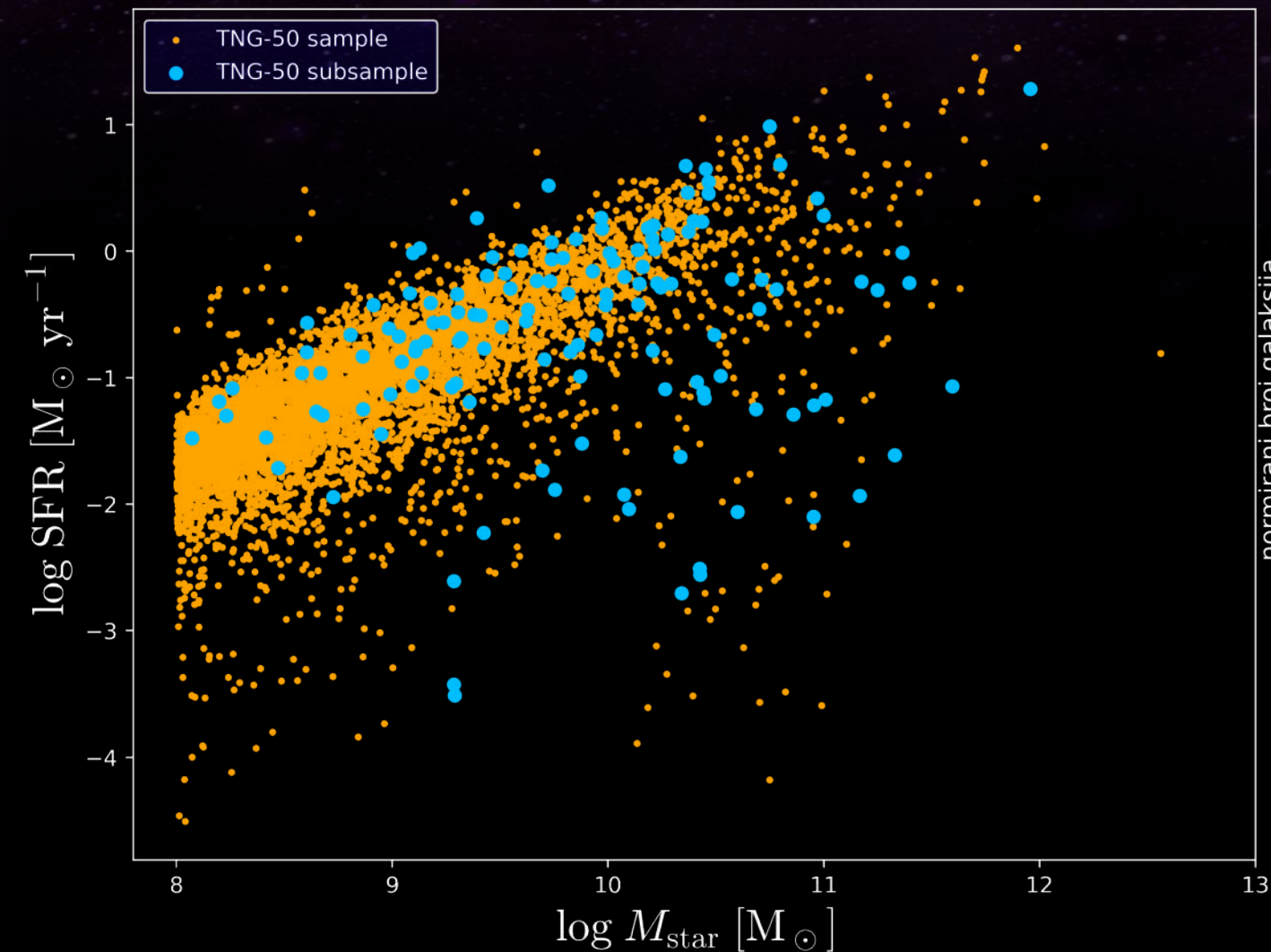


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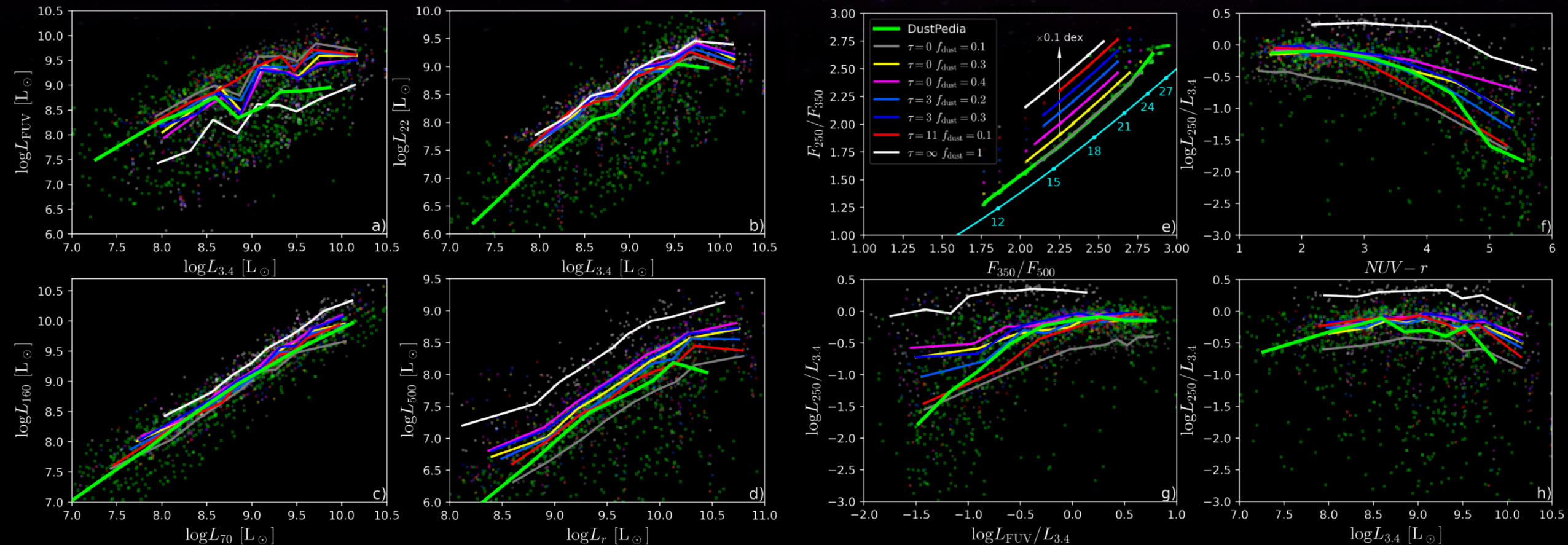
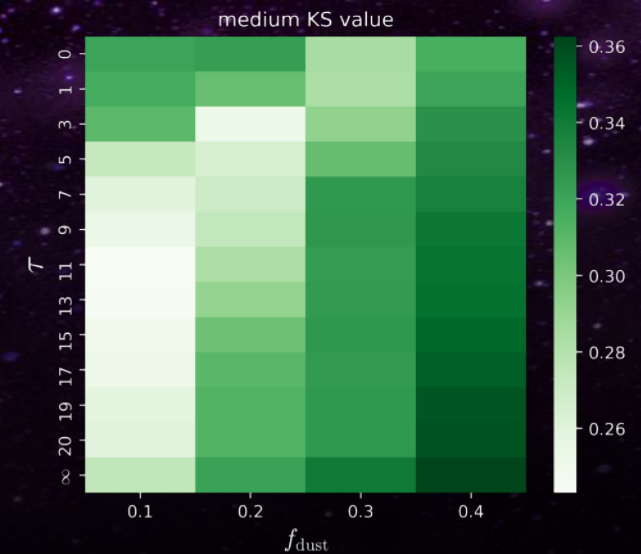
TNG

Priprema uzorka

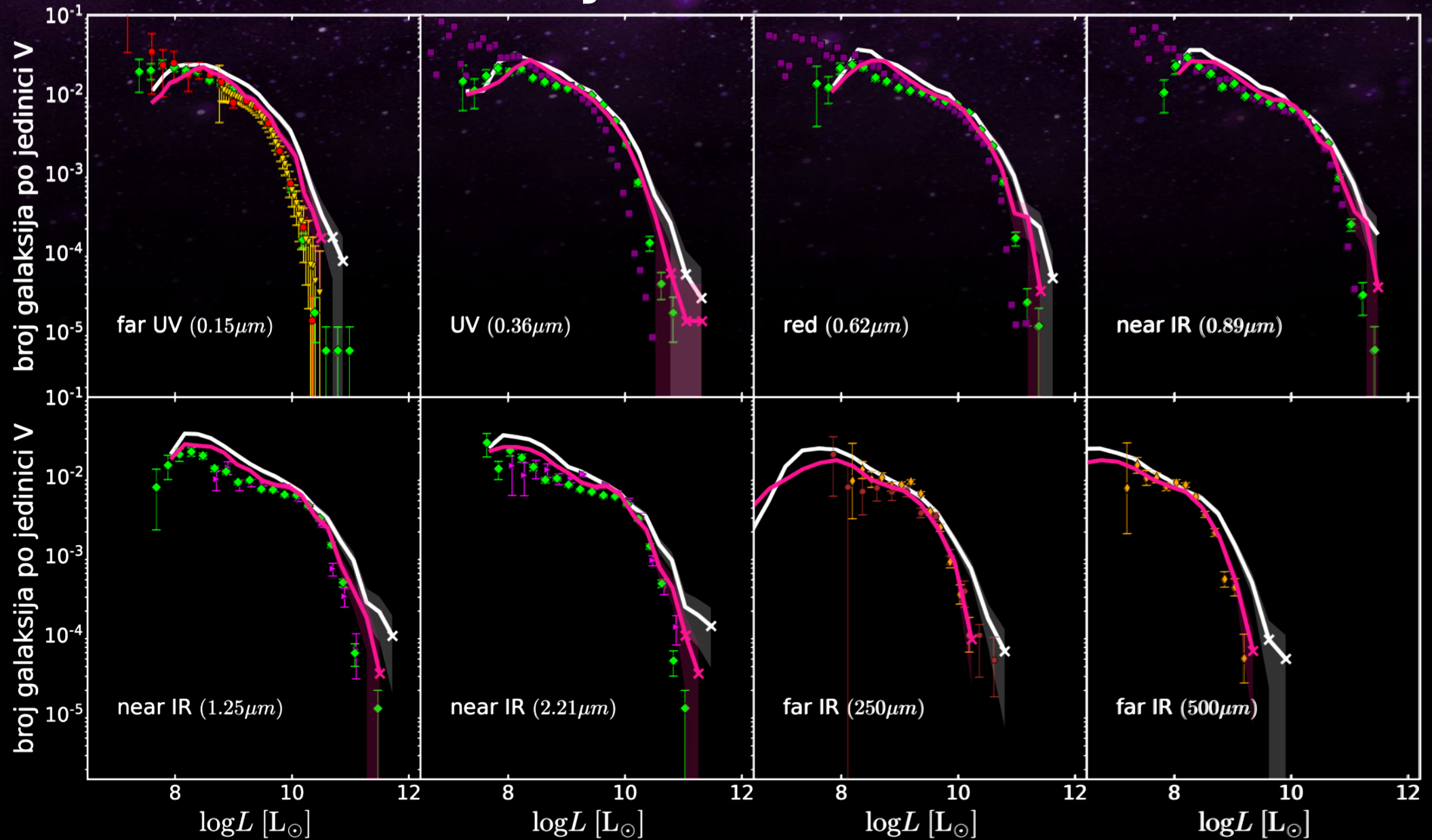


TNG

Kalibracija



Funkcije luminoznosti





Zaključak



Kosmološke simulacije + prenos zračenja + SED fitting
=
Konzistentno poređenje sa posmatranjima

- Kosmološke simulacije se još uvek usavršavaju
- Za realistične rezultate, prašina se ne sme zanemariti
- Nove generacije kosmoloških simulacija + prašina + PZ

